180° apart, which operate through reduction gears to turn rubber-faced driving wheels which are held by springs against the vertical flanges of the rotating dome. This design has proved effective, and the friction of the rubber faces provides a brake against rotation of the dome, by high winds.

A travelling crane with a capacity of 60 tons is attached to the main arches of the dome, and the platform for carrying the observer to the small turret in the centre of the tube at the prime focus of the telescope will also be supported by this part of the structure. The basement of the dome will contain the large aluminizing chamber, a number of offices, photographic rooms under controlled temperature, small physical and chemical laboratories and the pier of the large coudé spectrograph room. The electrical control boards are housed on a mezzanine floor, and above this but just below the level of the telescope mounting is the main observing floor.

It is essential in the case of the 200-inch telescope, in which the field of sharp definition at the centre of the photographic plate is limited and the value of observing time is extremely high, that the observational programme be defined as accurately as possible through survey work and identification of objects with instruments having wide angular fields and great light efficiency. Two Schmidt telescopes have been planned for this purpose, one of which, with an effective aperture of 18 inches and a focal ratio of 2·0, has been in operation for about three years. It has been most productive in studies of nebulæ and the discovery of supernovæ. A second instrument of this type, with an effective aperture of 48 inches and of focal ratio 2·5, is now under construction. The 45-foot dome has been erected on Palomar Mountain and the 72-inch pyrex disk for the spherical mirror has been received from the Corning Glass Works. The figuring and support of the 48-inch Schmidt correcting plate, which will not exceed one-half inch in thickness, will present some interesting optical and mechanical problems.

The Cell Theory

Its Past, Present and Future

AMONG the important meetings held by the American Association at Richmond, Virginia, in December, were those dealing with the cell theory—its development, its present status, and its future possibilities. These meetings were in the nature of a symposium and combined the best thought of the three sections of the Association, on history, botany, and zoology, which collaborated in the programme.

Seven outstanding papers by eminent scholars were presented in two sessions, morning and afternoon of December 27. Those taking part were: Prof. L. L. Woodruff of Yale University; Prof. J. S. Karling of Columbia University; Prof. E. G. Conklin of Princeton University; Prof. G. A. Baitsell of Yale University; Prof. Paul Weiss of the University of Chicago; Prof. Franz Schrader of Columbia University; and Prof. C. E. McClung of the University of Pennsylvania. The discussion and attendance throughout were exceptionally good, more than a hundred and fifty being present at the afternoon meeting.

The morning session, which was devoted to historical aspects, brought some surprising results, especially as bearing upon the two men, Schleiden and Schwann, who up to the present day have generally been given most credit with respect to the origin of the cell theory, which they were supposed to have enunciated a century ago [see also NATURE of February 18, p. 293].

There was apparent agreement in the scholarly papers presented by Profs. Karling and Conklin that the cell theory was projected some time prior to the appearance of the works of Schleiden and Schwann, that these two men added nothing either in content or in clarity with respect to the theory as such, and that they in fact lent support to a general view of cell formation which was completely erroneous.

Prof. Woodruff dealt with the preceding period and with the influence of the microscope. One hundred and seventy years before 1838, Robert Hooke had described little boxes or cells seen under the microscope, and from his day onward other significant observations on cells had been recorded by such men as Malpighi, Grew, Wolff, and Lamarck. With the beginning of the nineteenth century, the cell theory came into sharper focus and received fairly clear and explicit delineation at the hands of Mirbel (1802–1809), Dutrochet (1824), Turpin (1826), Meyen (1828–1838), Brown (1831), Demortier (1832), Purkinje (1835), Mohl (1835–1838), and Valentin (1838).

All these significant contributions preceded the works of Schleiden and Schwann. Why then, it was asked, have the two men been called the founders of the cell theory? Why the amazing situation "that we still continue to call it after them"? It would seem, as suggested by Profs. Karling and Conklin, that bluff and brag on Schleiden's part entered very largely into the picture. He underestimated, ignored, or ridiculed really important contributions of predecessors and contemporaries, and thus gained a wholly unwarranted recognition; and Schwann borrowed from Schleiden's arrogant claims as to plant cells and applied the same views to animal cells. Prof. Conklin concluded his most interesting paper by suggesting that "it would be more accurate as well as more becoming to strike out of our literature these personal possession tags attached to important discoveries, such as . . . the cell theory of Schleiden and Schwann!"

The afternoon session of the symposium, devoted to the present and the future of the cell theory, developed what appeared like a cleavage in points of view between those who see the problem primarily in terms of physical forces (of surface tensions, physical pressures, and electrical attractions and repulsions), and those who hold that living matter exhibits certain characteristics (such as variability, selective direction, and unfoldment in a temporal sequence) which sharply differentiate the organic from the inorganic.

It was generally agreed that the organization of the cell is exceedingly complex and that there is still much to be learned about it. Yet, on one hand it was maintained by Prof. Baitsell that the difference between the organic and the inorganic is "not one of *kind* but merely of *degree of complexity*. . . . Since the same materials are used in both domains, they must conform to the same elemental patterns." Recent advances in cellular knowledge are due primarily to the work of physicists and chemists. Prof. Schrader, who was concerned chiefly with the present status of mitosis, asked for renewed consideration of a 'dynamic' hypothesis. He suggested, however, that such a hypothesis meets with many difficulties which recent findings have by no means removed, and that it is a foregone conclusion that the final explanation will not be as simple as had once been thought.

On the other hand, it was pointed out by Profs. Weiss and McClung that, although "the cells derived from an egg have definite, innate capacities of their own . . . the fact that the individual cell can differentiate in a variety of directions but actually differentiates only in one, calls for factors which direct each cell selectively into its proper course. These factors, by their very nature, are super-cellular." They apparently derive from the organism as a whole and suggest the presence of "racial material in a linear order within the chromosomes. . . . Since living systems have unique phenomena of a higher order (than the non-living), like reproduction, metabolism, and consciousness, it is only logical to conclude that there must be units of a new order to explain them."

The participants in the afternoon meeting were in if necessary agreement that there is no sharp break between the living and the non-living. The progressive series of integrations does not stop at the molecular but continues to higher orders. Furthermore, the chemical elements found in the living orders, and their physical and chemical properties and interactions, are, it would seem, precisely the same as those found in the non-living orders. If there was difference of opinion, it appeared to be as to whether the integrations of a higher order (such as the cellular) could be completely explained in terms of principles derived from a lower order (such as the molecular), or whether, since the living orders have properties not found in the non-living, they must have their own peculiar units and be explained primarily in terms of those units. The future, it was held, should soon bring us closer to a resolution of such disputed questions. JOSEPH MAYER.

Obituary Notices

Prof. A. Smithells, C.M.G., F.R.S.

THE death of Prof. Arthur Smithells, on February 8 at the age of seventy-eight years, has removed from the world of science one of the most distinguished participants in the successful effort that has been made in the last half century to break down the barriers between a science too isolated and self-satisfied and a community too indifferent and unconscious of its own needs. No man could be more permeated than he was with a real reverence and enthusiasm for scientific work and achievement. His more intimate personal friendships were almost entirely with men of science, and his own work on the structure of flame was marked by keen insight and exceptional experimental ingenuity and skill.

Smithells was trained at Owens College, Manchester, and went on to enjoy the pleasant life and invigorating mental atmosphere which Munich and Heidelberg offered to students in those days, returning to an assistant lectureship at Owens. But, at the early age of twenty-five years, he was called to the chair of chemistry at the Yorkshire College in Leeds, and there was faced with the responsibilities and opportunities of a provincial college which was aspiring to be a university, and of a school of chemistry in a great industrial centre. Then came a